

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,167,032 B1
APPLICATION NO. : 10/815403
DATED : January 23, 2007
INVENTOR(S) : Danny S. Barlow

Page 1 of 5

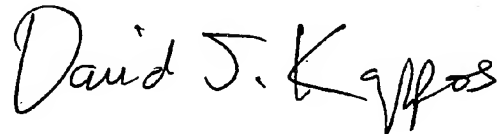
It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

The Title page, showing an illustrative figure, should be deleted and substitute therefor the attached title page.

Delete 3 Formal Drawing sheets 1, 3 and 4, for Figure 1, Figure 3A, and Figure 3B and substitute therefor the Drawing sheets, consisting of figs. 1, 3A-3B as shown on the attached pages.

Signed and Sealed this

Twenty-second Day of September, 2009

A handwritten signature in black ink, reading "David J. Kappos". The signature is written in a cursive, flowing style with a large initial 'D' and 'K'.

David J. Kappos
Director of the United States Patent and Trademark Office

(12) **United States Patent**
Barlow

(10) **Patent No.:** **US 7,167,032 B1**
(45) **Date of Patent:** **Jan. 23, 2007**

(54) **SELF-ADJUSTING SCHMITT TRIGGER**

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(73) **Assignee:** **Lattice Semiconductor Corporation, Hillsboro, OR (US)**

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(h) by 0 days.

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H03K 3/12 (2006.01)

(52) **U.S. Cl.** 327/205

(58) **Field of Classification Search** 327/205,
327/206, 208, 210
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,376,251 A * 3/1983 Kobayashi et al. 327/165
4,539,489 A 9/1985 Vaughn 327/205
5,341,046 A * 8/1994 Crafts 327/427
5,489,866 A * 2/1996 Diba 327/206

5,945,859 A * 8/1999 Pang 327/206
6,091,265 A * 7/2000 Singh 326/83
6,127,898 A * 10/2000 Naura 331/57
6,433,602 B1 8/2002 Lall et al. 327/205
6,549,048 B2 * 4/2003 Tailliet 327/205
6,566,926 B1 * 5/2003 Patterson 327/206
6,700,424 B2 * 3/2004 Feng 327/206
6,870,413 B1 * 3/2005 Chang et al. 327/205

* cited by examiner

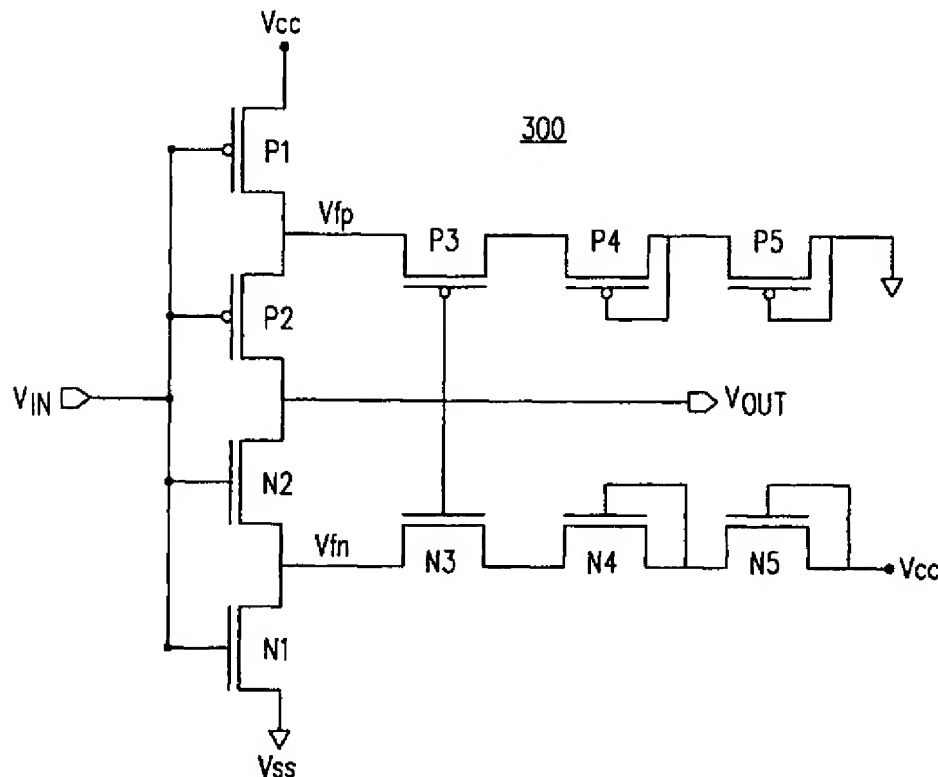
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(57) **ABSTRACT**

A Schmitt trigger includes a PMOS transistor and an NMOS transistor, each having a gate coupled to an output voltage terminal. The Schmitt trigger is configured such that an input voltage that switches on the PMOS transistor determines a low voltage threshold and an input voltage that switches on the NMOS transistor determines a high voltage threshold. By coupling devices such as diodes to either or both of the PMOS and NMOS transistors, a margin between the low voltage threshold and ground and between the high voltage threshold and a supply voltage are maintained as the supply voltage is reduced. In addition, hysteresis is maintained or increased as supply voltage is increased.

19 Claims, 5 Drawing Sheets



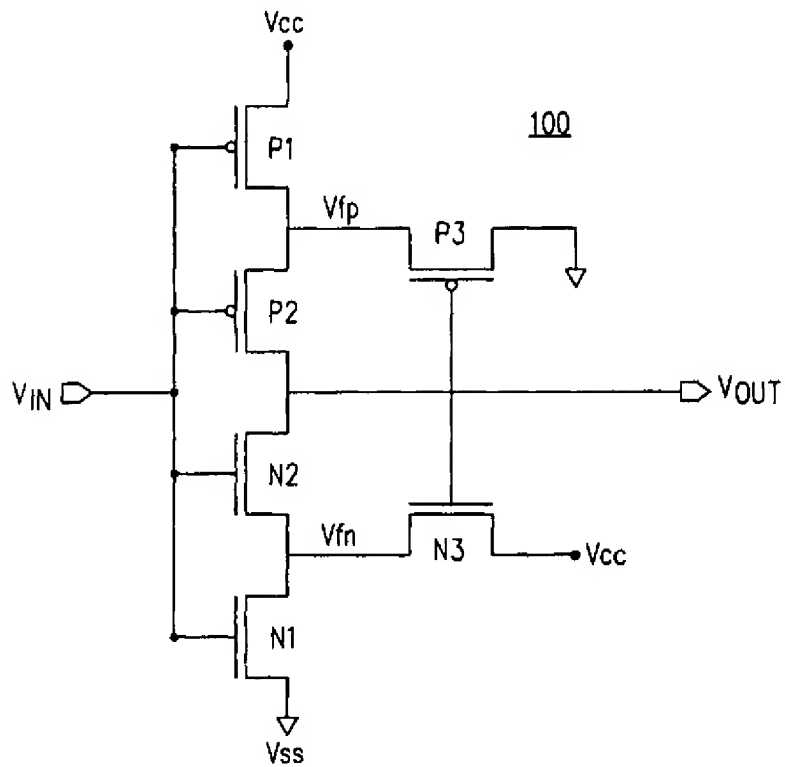


FIG. 1
(PRIOR ART)

